

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP00/06442

A. CLASSIFICATION OF SUBJECT MATTER  
Int.Cl.<sup>7</sup> G02B 6/16, 6/10

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
Int.Cl.<sup>7</sup> G02B 6/00-6/54, H04B 10/00-10/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2000  
Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Elsevier Science Server, SciSearch(DIALOG),  
IEEE/IEE Electronic Library online[long-period <near/3> grating],  
JICST FILE(JOIS)[long-period\* grating] (in Japanese)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	EP, 897124, A1 (Photonics Research Ontario), 17 February, 1999 (17.02.99) & JP, 11-174245, A	1-6 7-16
Y	WO, 95/22068, A1 (UNIVERSITY OF SYDNEY), 17 August, 1995 (17.08.95), page 4, lines 7 to 15; page 5, line 28 to page 6, line 24; Fig. 1 & EP, 749587, A1 & JP, 9-508713, A & US, 5830622, A	1-6
A	Michiko HARUMOTO, et al., "Juuretsu Chou Shuuki Fibre Grating ni yoru L-band you Ritokutoukaki"; Transactions 1 of Electronics Society Meeting in 1999, 16 August, 1999, C-3-72, page 178	1-16
A	LIU, Y. ET AL.: Phase shifted and cascaded long-period fiber gratings; Optics Communications, 01 June 1999, Vol.164, pp.27-31	1-16
A	LEE, B.H. ET AL.: Dependence of fringe spacing on the grating separation in a long-period fiber grating pair;	1-16

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 13 December, 2000 (13.12.00)	Date of mailing of the international search report 26 December, 2000 (26.12.00)
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Name and mailing address of the ISA/  
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	APPLIED OPTICS, 1 June 1999, Vol.38, No.16, pp.3450-3459	
A	QIAN, J.R. ET AL.: Gain flattening fibre filters using phase-shifted long period fibre gratings; ELECTRONICS LETTERS, 28 May 1998, Vol.34, No.11, pp.1132-1133	1-16
A	JP, 10-319259, A (Sumitomo Electric Industries, Ltd.), 04 December, 1998 (04.12.98) (Family: none)	1-16
P,X	Michiko HARUMOTO, et al., "Isou Shift Chou Shuuki Fibre Grating"; Electronics 1; Transactions of General Meeting in 2000, the Institute of Electronics, Information and Communication Engineers, 07 March, 2000, C-3-69, page 249	1-16

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70 Rule 41(2)

25 JUL 2002

## PATENT COOPERATION TREATY

## PCT

Translation

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference FP00-0155-00	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/JP00/06442	International filing date (day month year) 20 September 2000 (20.09.00)	Priority date (day month year) 20 September 1999 (20.09.99)
International Patent Classification (IPC) or national classification and IPC G02B 6/16, 6/10		
Applicant SUMITOMO ELECTRIC INDUSTRIES, LTD.		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>                    </u> sheets.</p>	
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>	

Date of submission of the demand 14 February 2001 (14.02.01)	Date of completion of this report 07 November 2001 (07.11.2001)
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☒ the international application as originally filed
- ☐ the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the claims:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the drawings:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**4. ☐ The amendments have resulted in the cancellation of**

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig. \_\_\_\_\_

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)) \*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

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## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	1-16	YES
	Claims		NO
Inventive step (IS)	Claims	8-13	YES
	Claims	1-7, 14-16	NO
Industrial applicability (IA)	Claims	1-16	YES
	Claims		NO

## 2. Citations and explanations

Claims 1-6 and 7, 14-16

Document 1: EP, 897124, A1 (Photonics Research Ontario), February 17, 1999 (17.02.99)

Document 2: WO, 95/22068, A1 (University of Sydney), August 17, 1995 (17.08.95), page 4, lines 7 to 15; page 5, line 28 to page 6, line 24; Fig. 1

Document 3: Michiko HARUMOTO et al., "Juuretsu Chou Shuuki Fiber Grating ni yoru L-band you Ritokutoukaki", Proceedings 1 of the 1999 General Meeting of the IEEE Electronics Society, August 16, 1999 (16.08.99), C-3-72, page 178

Document 4: LUI, Y. et al., "Phase shifted and cascaded long-period fiber gratings", Optics Communications, June 1, 1999, Vol. 164, pp. 27-31

Document 5: LEE, B.H. et al., "Dependence of fringe spacing on the grating separation in a long-period fiber grating pair", Applied Optics, June 1, 1999, Vol. 38, No. 16, pp. 3450-3459

Document 6: QIAN, J.R. et al., "Gain flattening fibre filters using phase-shifted long period fiber gratings", Electronics Letters, May

28, 1998, Vol. 34, No. 11, pp. 1132-1133

Document 7: JP, 10-319259, A (Sumitomo Electric Industries, Ltd.), December 4, 1998  
(04.12.98)

Document 1 discloses a method for forming a long-period grating in an optical waveguide by irradiating ultra-violet rays through an amplitude mask, wherein by forming a phase shifted area on the amplitude mask, a phase shifted area is formed with respect to the long-period grating formed in the optical waveguide.

Document 2 discloses the feature wherein, in order to form a phase-shifted area and modify the optical characteristics of the grating of an optical fiber grating in which a grating with a modulated refractive index is formed, a post-treatment is performed wherein the grating is exposed to localised ultra-violet light.

It would be obvious to a person skilled in the art to apply the post-treatment that uses localised ultra-violet light disclosed in Document 2 in order to form a phase shifted area or in order to modify the optical characteristics in the long-period grating disclosed in Document 1.

A long-period grating manufactured using the method discussed above is considered to be the optical loss filter provided with "a phase shifted member which modifies the amount of phase rotation of the core mode" that is defined in Claim 7.

The features set forth in dependent Claims 2, 4-6 and 14-16 fall within the state of the art. (See Documents 3 to 7, in addition to Documents 1 and 2, which reflect the general state of the art in this technical field.)

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Therefore, the inventions set forth in Claims 1-6, and 7, 14-16 do not involve an inventive step in the light of Documents 1 to 7.